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J E T P R O P U L S I O N L A B O R A T O R Y
C A L I F O R N I A I N S T I T U T E O F T E C H N O L O G Y
P a s a d e n a , C a l i f o r n i a 9 1 1 0 9

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Foreword

Sammy Kayali
Electronic Parts Engineering Office Manager



Fiscal 2002 marked a very productive year with continued strategic definition and infrastructure rebuilding for the Electronic Parts Engineering Office. Our personnel were highly utilized in providing electronic parts selection, evaluation, characterization and acquisition services to over 26 active JPL projects and instruments. Figure F-1 shows the distribution of our workforce in FTE's across our projects. The Electronic Parts Engineering Team was critical in assisting the Mars Exploration Rover (MER) Project to address parts-related issues and complete the engineering acquisition and documentation of all the parts evaluation and test activities. In addition, we provided reliability and radiation effects services to three (3) NASA Centers and continue to be the lead Center for electronic parts reliability and radiation effects expertise.

During the year, we implemented a number of initiatives to improve our services and enhance our capabilities. We developed the Institutional Parts Program Requirements (IPPR) document as a baseline for the development of parts program plans in support of JPL projects and instruments. We also developed and implemented the Cost Estimating Tool (CET) to assist in arriving at clear and methodical parts program cost estimates with known and documented assumptions. We continued our practice of conducting Monthly Management

Reviews (MMR) and risk assessments of all the project support activities across the section. We instituted weekly Service Order Status Reports to provide a measure of the financial status and assist the project interface engineer (PIE) in managing the project activities. The Parts Review Board (PRB) was also implemented to provide consistency of parts program plans and risk assessment across the organization.

We continue to be the lead NASA Center for electronic parts reliability and radiation effects and to ensure the continuation of our technical leadership, we embarked on a laboratory technical infrastructure enhancement effort. We initiated the procurement of an additional Scanning Electron Microscope (SEM) providing us four capable systems and

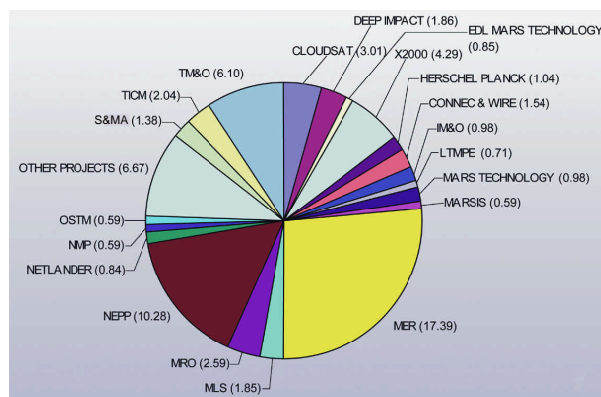


Figure F-1. Office 514 workforce allocation (in full-time equivalents) for projects. See glossary for acronyms.

enhancing our high-resolution imaging capabilities of advanced microelectronics technologies. Also, in collaboration with our partners at TIMA Laboratories in Grenoble, France, we developed a Digital Fault Injection and Analysis System which was utilized in the characterization of a number of advanced commercial microprocessors such as the Power PC750 family of microprocessors. To enhance our device test capabilities, we acquired a new Eagle RF/Analog test system providing us with capabilities to test advanced devices such as high-resolution Analog-to-Digital Converters to frequencies up to 4 GHz. We also added optical device test capabilities to support our reliability and radiation effects test and characterization needs. In addition, we acquired new thermal test chambers to allow for the controlled characterization of electronic devices at extreme temperatures.

Our personnel continued to be very active and contributing members of the technical community by publishing over 76 papers, reports, and presentations at international conferences and workshops. The Electronic Parts Engineering Office hosted the 5th Annual Microelectronics Reliability and Qualification Workshop and our personnel served on the Technical Program Committees or Advisory Boards of a number of industry conferences such as the Nuclear Space Radiation Effects Conference (NSREC), the International Reliability Physics Symposium (IRPS), the Government Microelectronics Applications Conference (GOMAC), the Gallium Arsenide Reliability Workshop, the Materials Research Society (MRS), the Space Parts Working Group (SPWG), and a number of others.

To provide a more cohesive electronic parts evalua-

tion program, the technical planning and management of all the electronic parts evaluation activities in the Office were combined under the leadership of the supervisor of the Parts Engineering Group. We were also able to establish new industry and university relations and enhance existing ones in support of our efforts in the evaluation and characterization of advanced microelectronics for near-term JPL space applications. Agreements with industrial partners and universities such as Interpoint-Crane, Maxwell Technologies, Xilinx, TIMA Laboratories, Clemson University, California State University, Northridge, the University of Maryland and others have resulted in an increase of available data and understanding of reliability issues or the effects of space radiation on specific technologies of interest to the JPL and NASA community.

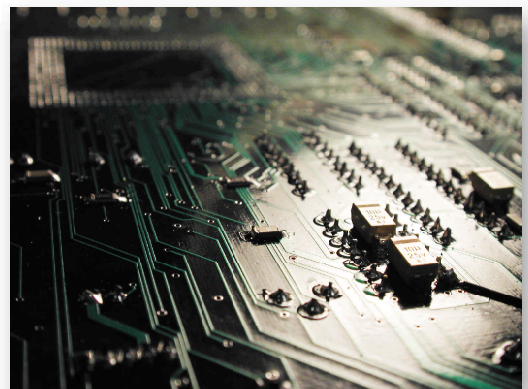
In our efforts to increase our customer outreach, members of the Electronic Parts Engineering Office provided a number of technical presentations and classes at JPL and NASA LaRC in the area of Radiation Effects and Electronic Parts Reliability. We also continued to support the "JPL Cognizant Engineer Training Course" in describing the services of the Electronic Parts Engineering Office and methods for communication and dissemination of our capabilities and services.

I am confident that every member of our team is committed to providing the best possible service to our customers. I also hope that the accomplishments and contributions listed here convey the pride we all have in this institution and my appreciation to the members of the Electronic Parts Engineering Office for making my job of managing this organization a rewarding one.

S e c t i o n 1

O R G A N I Z A T I O N

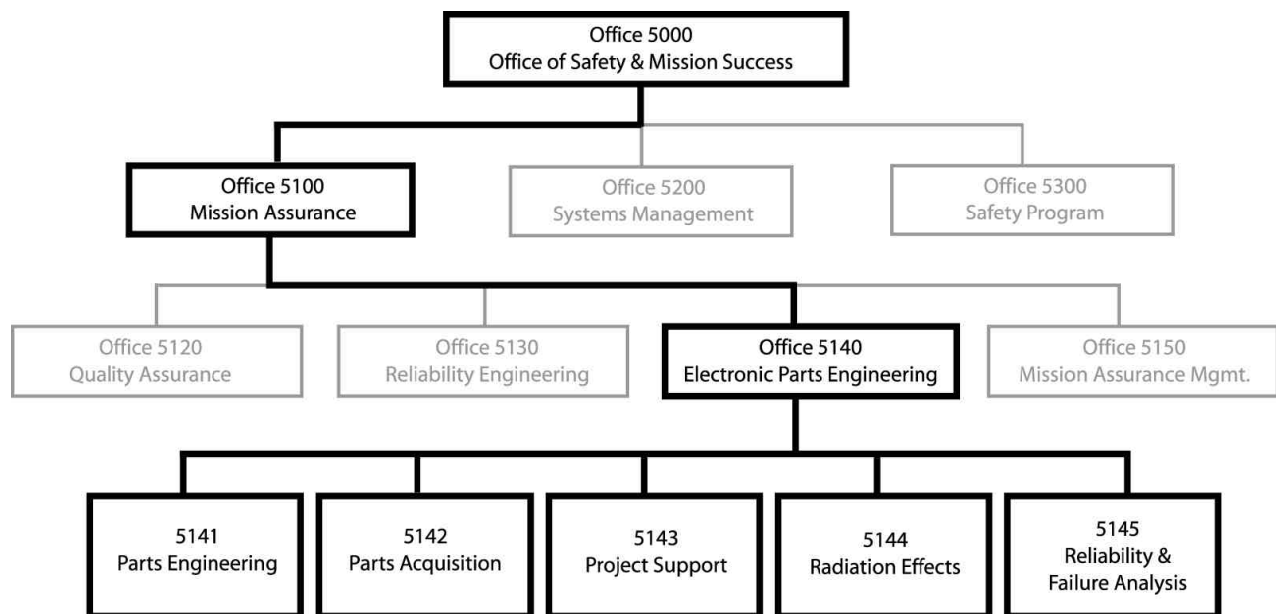
EPE



Excellence in the selection, evaluation, and acquisition of reliable microelectronics for space applications based on the latest technical knowledge, superior laboratory capabilities, efficient and cost-effective processes, and commitment to customer service.

EPE Vision Statement

514 ORGANIZATION CHART



514 Management Staff

Manager: Sammy Kayali
Deputy Manager: Rich Kemski



STAFF MEMBERS: David Chernobeiff, Charlie Kyriacou, Allan Johnston, Choon Lee, Robert Menke, Jonathan Perret, Deanna (DiDi) Rowe, Peter Schrock, Patrick Smith, Jay Sucher (not pictured: Susan Gilbert-Hagood)

514 CHARTER

Develop and implement electronic parts programs, requirements, and plans for JPL projects and instruments

Provide electronic parts selection, evaluation, test, characterization, and application support to JPL projects

Operate and maintain the Radiation Effects Laboratory, the Reliability & Failure Analysis Laboratory, and the Electronic Parts Stores

Provide for the acquisition, test, inventory, and records for flight electronic parts

Perform electronic parts reliability and radiation effects testing, analysis and research in support of the NASA Electronic Parts and Packaging (NEPP) Program

Provide failure investigation, analyses, and recommendations for corrective action

Develop industry and government partnerships and collaboration agreements to benefit JPL applications and activities

Parts Engineering Group

Group Supervisor: Robert Menke



STAFF MEMBERS: Shri Agarwal, Gary Bivins, Yuan Chen, Cindee Dlugos, Nayla Fernandes, Ronald Herin, Ramin Roosta, Mike Sandor, Frank Stott, Jim Weiler, Chris Zuniga. Not pictured: Ed Powell, Mark White

The Parts Engineering Group is composed of electronic parts engineers specializing in specific areas of the discipline, i.e. memories, linear devices, passive components, etc. The “parts specialists” utilize their knowledge and expertise in reviewing the suitability of selected components for an application or in evaluating and recommending alternative parts, that may be better suited for the application. In addition, they are responsible for resolving parts technical issues and providing technical risk assessments for non-compliant parts.

GROUP RESPONSIBILITIES:

- Review parts lists for part reliability conformance to project requirements
- Recommend replacement parts when parts do not conform to requirements
- Generate Non Standard Parts Approval Request (NSPAR) for parts that do not meet requirements, specifying the qualification and screening test required
- Approve the NSPAR test plans, track the testing and review completed test data
- Review and approve test data that is submitted by parts vendors to ensure requirements are met
- Assess waivers
- Support Material Review Board as required
- Provide designers information on the latest part types and performances via the Parts Users Group (PUG) meetings and solicit feedback of parts needed by designers
- Perform characterization tests on potential high-payoff devices
- Develop Users Guides on such subjects as Known Good Die, Plastic Encapsulated Microcircuits, COTS utilization, and others
- Develop derating guidelines

Parts Acquisition Group

Group Supervisor: Jay Sucher



STAFF MEMBERS: Alice Dominguez, Debbie Drake, Kristan Ellis, Ruben Garcia, Omar Heinemann, Corey Lovers, Linda Mayo-Cupples, Patty McCauley, Michael Parks, Rick Stiebel, Joan Westgate

MISSION: Provide parts procurement services for JPL projects and instruments, provide documentation and tracking of Electronic Parts Lists, provide electronic parts data for project and instrument MMRs, provide Bonded Stores for projects and instruments, and deliver parts to Customers with tracking documentation

GROUP RESPONSIBILITIES:

Electronic Parts Representatives: Enter Parts lists into the EPINS (Electronic Parts Information Network System) tracking database. This system also provides tracking for acquisition of the parts and forms a permanent acquisition data record for the subject project or instrument. The Parts Rep supports the Parts Interface Engineer (PIE) to maintain accurate lists, respond to changes, submit buy requests and kit parts for delivery to the user.

Data Coordinators: Support the PIE, Order Desk Clerks and Parts Rep in tracking the status of procurements, part list review status, radiation reviews/test status and budget status. The data is used by the PIE to keep the Project informed through reports and Monthly Management Reviews (MMR).

Electronic Parts Order Desk: Support the PIE in the placement of electronic parts orders and interface with numerous distributors and parts brokers for placement of purchase requisitions into the JPL procurement system.

Project Stores: Provide for data entry into EPINS for receiving parts and the "kitting" activity, which delivers the parts to the Project. Project Bonded Stores carries over \$30 million of electronic parts in stock. Many of these parts are available for new projects or instruments.

Project Support Group

Group Supervisor: Charlie Kyriacou



STAFF MEMBERS: Tom Brown, Kelly Carter, Cindee Dlugos, Ed Erginsoy, Don Franzen, Paul Lonnquist, Greg Rowe, Jeff Sokol, Kelly Stanford. Not pictured: Mark Cooper, Paul Hesse, Dave Peters, David Ye

MISSION: Provide for the planning and implementation functions of parts programs for JPL projects, science instruments and experiments.

GROUP RESPONSIBILITIES:

- Parts program management
- Development and implementation of project parts requirements in accord with JPL requirements
- Monitoring of contractor parts activities
- Flight parts procurement and acquisition
- Flight parts tracking
- Contract technical management
- Documentation of all parts issues and evaluation status

The Project Support Group has extensive experience in supporting the development of parts programs, acquisition strategies, procurement tracking, coordinating special testing and analysis and parts failure investigation. It is the gateway to many of the electronic parts resources at the Jet Propulsion Laboratory.

Radiation Effects Group

Group Supervisor: Allan Johnston



STAFF MEMBERS: Heidi Becker, Yvette Berumen, Larry Edmonds, Steve Guertin, Farokh Irom, Jennifer Lehman, Steve McClure, Travis Minto, Tets Miyahira, Duc Nguyen, Mike O'Connor, Jeff Patterson, Bruce Pritchard, Bernie Rax, Leif Scheick, Luis Selva, Gary Swift, Ana Veglovvarria, Mike Wiedeman, Candice Yui. Not pictured: Farhad Farmanesh, Farokh Irom, Travis Minto

MISSION: Investigate the effects of space radiation on present and future microelectronic and optoelectronic technologies, evaluate the risk of using them in specific space missions, and recommend component and design techniques for JPL and NASA programs to reduce reliability risk from space radiation.

GROUP RESPONSIBILITIES:

- Conduct evaluation studies of radiation effects on advanced microelectronic and optoelectronic devices
- Analysis of radiation data and effects on system performance
- Investigation and modeling of catastrophic failure mechanisms including latchup, single-event hard errors and gate rupture effects, as well as permanent damage from protons and electrons
- Support JPL projects and instruments in radiation test and data analysis
- Investigation of the effects of device scaling and design evolution on radiation susceptibility
- Maintain the Radiation Effects laboratories and instruments

Reliability & Failure Analysis Group

Group Supervisor: Patrick Smith



STAFF MEMBERS: Prudencio Alonso, Saverio D'Agostino, Ken Evans, Manny Gallegos, Adalberto Garcia, Sid Johnson, Rosa Leon, Jim Okuno, Mihail Petkov, Ron Ruiz, Jose Uribe, Duc Vu, Joanne Wellman, Luis Zuniga. Not pictured: Joan Westgate

MISSION: Assess the reliability of present and future device technologies for JPL programs and maximize the performance of JPL missions by introducing advanced, high-performance reliability analysis techniques on an accelerated schedule. Support JPL projects and instruments in determining the physical cause of component failures and work with device engineers to eliminate the failure mechanisms.

GROUP RESPONSIBILITIES:

- Conduct microelectronics reliability evaluations and failure analysis in support of JPL missions
- Maintain the Reliability and Failure Analysis laboratory and instruments
- Conduct Destructive Physical Analysis and Constructive Analysis
- Conduct Failure Investigations and Analysis in support of JPL missions

